

# NASA TECH BRIEF

## Goddard Space Flight Center



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### Heater Improves Cold-Temperature Capacity of Silver-Cadmium Batteries

#### The problem:

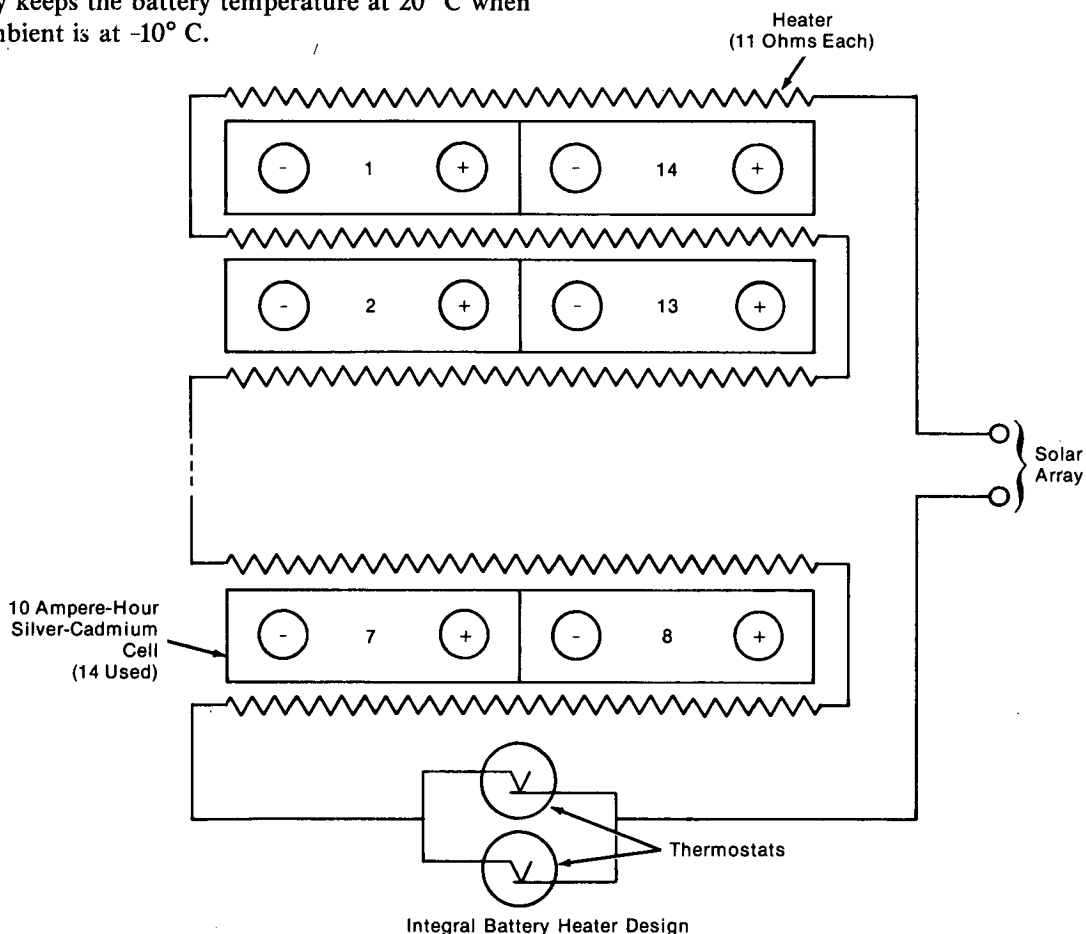
Silver-cadmium batteries have significant capacity losses at cold temperatures. For example, a battery which delivers 11.2 ampere-hours at a temperature of 20° C will yield only 6.0 ampere-hours at -10° C, resulting in a 46-percent loss in capacity.

#### The solution:

A 9-watt heater included as an integral part of the battery keeps the battery temperature at 20° C when the ambient is at -10° C.

#### How it's done:

A multicell battery with heaters is shown in the figure. The 14-cell package is designed to provide 14-Vdc and includes eight heaters (not all the heaters are shown). Each heater is an 11-ohm self-adhesive strip placed across the broad face of each pair of cells. They are installed before the cells are wired. The heaters are in series and are connected through a pair of redundant thermostats.



(continued overleaf)

The thermostats are designed to open when the battery temperature reaches  $15 \pm 2^{\circ}$  C. The most common failure is for the thermostats to remain open, in which case the batteries will not overheat. If the thermostats fail and remain closed, the heaters can be shut off by remote control to prevent battery damage. The total heater output is 9 watts and the entire heater system is powered by a separate solar-cell array. A 3-mm (1/8-in.) Teflon layer, or equivalent, serves as thermal insulation to isolate the battery package from its surroundings.

**Note:**

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
Code 704.1  
Greenbelt, Maryland 20771  
Reference: B75-10071

**Patent status:**

NASA has decided not to apply for a patent.

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